



Photocatalytic degradation of an azo dye Direct Sky Blue 5B in water: a comparative study using nanostructured ITO, ZnO, and ZnO/ITO thin films

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Received 12 February 2011; Accepted 27 March 2012

ABSTRACT

Indium tin oxide (ITO), zinc oxide (ZnO), and ZnO/ITO interface composite thin films were deposited on glass substrates using electron-beam evaporation and the sol-gel method. The porous 2%PEG-ZnO/ITO thin films were also have been prepared using the polyethylene glycol (PEG) as an organic template. The samples were characterized by UV-Vis spectroscopy, X-ray diffraction, and scanning electron microscopy techniques. The photocatalytic degradation of Direct Sky Blue 5B in an aqueous solution, as a model compound, was investigated using different catalysts in an attempt to compare the decomposition reaction rates. The effects of various experimental parameters, such as an initial concentration of the Direct Sky Blue 5B (5–10 mg/l), pH of the solution (4–9), and catalytic nature and its microstructure, were systematically studied to achieve the maximum degradation efficiency. The results obtained were fitted with the Langmuir-Hinshelwood model to study the degradation kinetics and were discussed in detail. Degradation with 2%PEG-ZnO/ITO was more efficient than with ITO, ZnO, and ZnO/ITO films.

Keywords: Photocatalytic degradation; Sol-gel; Direct Sky Blue 5B; Nanostructure; ZnO; ITO
